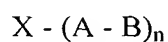


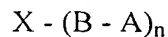
What is claimed is:

1. A water-soluble block copolymer having a mass average molecular weight of 2500 to 800000 and comprising, within a molecule, a poly(ethylene imine) block unit and a poly(N-propionylethylene imine) block unit.

2. A water-soluble block copolymer according to claim 1 represented by one of general formula (1a):

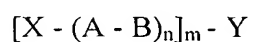


and general formula (1b):

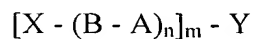


(in the formulae, X is a residue of a monovalent or greater polymerization initiator; A is the poly(ethylene imine) block unit; B is the poly(N-propionylethylene imine) block unit; and n is an integer being at least 1 and being within a range of valences of X).

3. A water-soluble block copolymer according to claim 1 represented by one of general formula (2a):



and general Formula (2b):

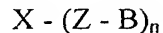


(in the formulae, X is a residue of a monovalent or greater polymerization initiator; A is the poly(ethylene imine) block unit; B is the poly(N-propionylethylene imine) block unit; Y is a residue of a monovalent or greater terminal compound; n is an integer being at least 1 and being within a range of valences of X; and m is an integer being at least 1 and being within a range of valences of X).

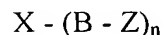
4. A water-soluble block copolymer according to claim 1, wherein a molar ratio of the poly(N-propionylethylene imine) block unit is 0.1 to 0.95 with respect to the poly(ethylene imine) block unit.

5. A water-soluble block copolymer according to one of claims 2 and 3, wherein X is the residue of the polymerization initiator having a valence of from 1 to 12.
6. A water-soluble block copolymer according to claim 3, wherein Y is the residue of the terminal compound having a valence of from 1 to 12.
7. A water-soluble block copolymer according to one of claims 2 and 3, wherein X is the residue of the polymerization initiator having a skeleton of one of a benzene skeleton, a porphyrin skeleton, a phthalocyanine skeleton, and a pyrene skeleton.
8. A water-soluble block copolymer according to claim 3, wherein Y is the residue of the terminal compound having a skeleton of one of a benzene skeleton, a porphyrin skeleton, a phthalocyanine skeleton, and a pyrene skeleton.
9. A production method for a water-soluble block copolymer comprising:
forming an emulsion by dispersing a water-soluble block copolymer having, in a molecule, a poly(N-formylethylene imine) block unit or a poly(N-acetylene imine) block unit, and a poly(N-propionylethylene imine) block unit in a solvent mixture of water and an organic solvent which is not compatible with water and in which poly(N-propionylethylene imine) is soluble; and
preferentially hydrolyzing the poly(N-formylethylene imine) block unit or the poly(N-acetylene imine) block unit of the water-soluble block copolymer in the presence of an acid or an alkali.
10. A production method for a water-soluble block copolymer according to claim 9, wherein the water-soluble block copolymer having, in the molecule, the poly(N-formylethylene imine) block unit or the poly(N-acetylene imine) block unit, and the poly(N-propionylethylene imine) block unit is represented by one of:

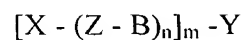
general formula (3a):



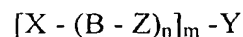
general formula (3b):



general formula (3c):



and general formula (3d):



(in the formulae, Z is the poly(N-formylethylene imine) block unit or the poly(N-acetylene imine) block unit; X is a residue of a monovalent or greater polymerization initiator; B is the poly(N-propionylethylene imine) block unit; n is an integer being at least 1 and being within a range of valences of X; and m is an integer of at least 1 being within a range of valences of X).

11. A production method for a water-soluble block copolymer according to claim 9, wherein a molar ratio of the poly(N-propionylethylene imine) block is 0.1 to 0.9 with respect to the poly(N-formylethylene imine) block unit or the poly(N-acetylene imine) block unit.

12. A production method for a water-soluble block copolymer according to claim 9, wherein a molar number of the acid or alkali is from 1 to 50 times the molar number of the monomer units making up the poly(N-formylethylene imine) block unit or the poly(N-acetylene imine) block unit.